

Serial No. 09/456,184

Please amend the above-identified application as follows.

IN THE CLAIMS:

Please replace the previous version of the claims with the following clean version, wherein claim 23 incorporates new amendments thereto.

C1
cont.
SUB
D1
cont.

1. A driving apparatus for driving a piezoelectric element serving as a driving source of an actuator comprising:
 - a waveform generator for generating a waveform signal varying over time;
 - a first driver for generating a first driving signal, wherein the first driving signal has a maximum voltage smaller than a voltage of inversion of polarization of the piezoelectric element and has a waveform derived from the waveform signal, the first driver being coupled to provide the first driving signal to the piezoelectric element in the polarization direction of the piezoelectric element; and
 - a second driver for generating a second driving signal, wherein said second driving signal has a maximum voltage smaller than the voltage of inversion of polarization of the piezoelectric element and has a waveform derived from the waveform signal, the second driver being coupled to provide the second driving signal to the piezoelectric element in a direction opposite to the polarization direction.
2. A driving apparatus in accordance with claim 1, wherein the second driving signal has a waveform which is an inversion of a waveform of the first driving signal.
3. A driving apparatus in accordance with claim 1, wherein the waveforms of the first and second driving signals are sine waves.
4. A driving apparatus in accordance with claim 1, wherein the waveforms of the first and second driving signals are sawtooth waves in which the inclination in a rising portion is different from that in a falling portion.
5. A driving apparatus in accordance with claim 1, wherein the first driver and the second driver respectively include an amplifier for amplifying the signal from the waveform generator.
6. A driving apparatus in accordance with claim 1, wherein the actuator is an impact type actuator comprising a first unit with the piezoelectric element and a second unit slidably held on and relatively movable against the first unit.

C1
cont.
SUB
D1
cont.

17. A driving apparatus for driving a piezoelectric element serving as a driving source of an actuator comprising:

a first driver for applying a first time varying driving signal to the piezoelectric element in a polarization direction thereof; and

a second driver for applying a second time varying driving signal to the piezoelectric element equal to or smaller than a voltage of inversion of polarization of the piezoelectric element in a direction opposite to the polarization direction.

18. A driving apparatus in accordance with claim 17 further comprising an electric power supply for supplying electric power to the first and second drivers.

19. A driving apparatus for driving a piezoelectric element serving as a driving source of an actuator comprising:

a first driver for applying a first driving signal to the piezoelectric element in a polarization direction thereof;

a second driver for applying a second driving signal to the piezoelectric element equal to or smaller than a voltage of inversion of polarization of the piezoelectric element in a direction opposite to the polarization direction;

an electric power supply for supplying electric power to the first and second drivers; and

a waveform generator for generating a time varying signal, wherein only the first driver applies the first driving signal corresponding to the waveform of the time varying signal when the time varying signal is larger than a predetermined level; and wherein both of the first and second driving signals correspond to the time varying signal when the time varying signal is smaller than the predetermined level.

20. A driving apparatus in accordance with claim 19, wherein the first and second driving signals are 0V when the time varying signal is equal to the predetermined level.

21. A driving apparatus in accordance with claim 19, wherein the waveforms of the first and second driving signals are sine waves.

22. A driving apparatus in accordance with claim 19, wherein the waveforms of the first and second driving signals are sawtooth waves in which the inclination in a rising portion is different from that in a falling portion.

23. (Twice Amended) A method for driving an actuator having a piezoelectric element serving as a driving source characterized by:

a first driving signal having a maximum voltage smaller than a voltage of inversion of polarization of the piezoelectric element is applied to the piezoelectric element in a polarization direction of the piezoelectric element; and

a second driving signal having the same voltage but the inverted polarization is applied to the piezoelectric element in a direction opposite to the polarization direction of the piezoelectric element.

24. A method in accordance with claim 23, wherein the second driving signal has a waveform which is an inversion of a waveform of the first driving signal.

25. A method in accordance with claim 23, wherein the waveforms of the first and second driving signals are sine waves.

26. A method in accordance with claim 23, wherein the waveforms of the first and second driving signals are sawtooth waves in which the inclination in a rising portion is different from that in a falling portion.